OBSERVATIONS ON THE SUMMER TANAGER IN NORTHEASTERN KANSAS

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THE Summer Tanager (*Piranga rubra*), a characteristic inhabitant of deciduous forests of the eastern United States, reaches its western limits in Kansas. The records for this state are concentrated near the eastern edge. Specimens in the University of Kansas Museum of Natural History were collected in Doniphan County (Geary, August 24), Wyandotte County (Bonner Springs, May 11), Douglas County (Lawrence, April, May, August and September), Miami County (Pigeon Lake, May 31), Labette County (10 mi. SW Oswego, July 6, 12 and 19), and Montgomery County (4 mi. N Caney, August 7 and 10). W. S. Long (unpublished thesis, Univ. Kansas Library, 1935) gives nesting records from Doniphan County and Kansas City. Nearly all these localities fall within the Deciduous Forest Formation as mapped by Braun (1950. "Deciduous Forests of Eastern North America"), and the others are closely adjacent to it.

On the University of Kansas Natural History Reservation, 5½ miles NNE Lawrence, this tanager is regularly present in summer as a breeding species. The earliest recorded dates for three different years were April 27, 1951, April 26, 1952, and April 28, 1953. These dates probably approximate the time of arrival and each year the tanagers were seen and heard frequently throughout the month of May.

Spatial Relations of Pairs

In May and June, 1952, singing males were recorded at seven well-separated locations on the 590-acre Reservation. In 1953 singing males were heard in six different locations, four of which corresponded well with the 1952 locations (see Fig. 1). Several pairs were seen repeatedly at about the same places. No encounters between members of different pairs ever were seen and the territories were so well spaced that, from the trees used as singing stations, songs of neighboring males never were audible. A minimum breeding population of at least six or seven pairs must have been present on the Reservation each year. Since some parts of the area were visited infrequently, and no systematic attempts at census were made, several additional pairs may have been present.

In every instance, pairs had their territories or headquarters in thick second-growth deciduous woods of elm (*Ulmus americana*), oaks (*Quercus Muehlenbergii, Q. velutina*) and hickory (mainly *Hicoria ovata*). However, the male of a pair that stayed near the Reservation buildings and another male seen and heard frequently did most of their singing in large honey locusts

(*Gleditsia triacanthos*) that were in fields near woodland edge. The woodland areas of more xeric aspect, notably south slopes dominated by such species as osage orange (*Maclura pomifera*), honey locust, and hackberry (*Celtis occidentalis*), were used little or not at all by the tanagers.

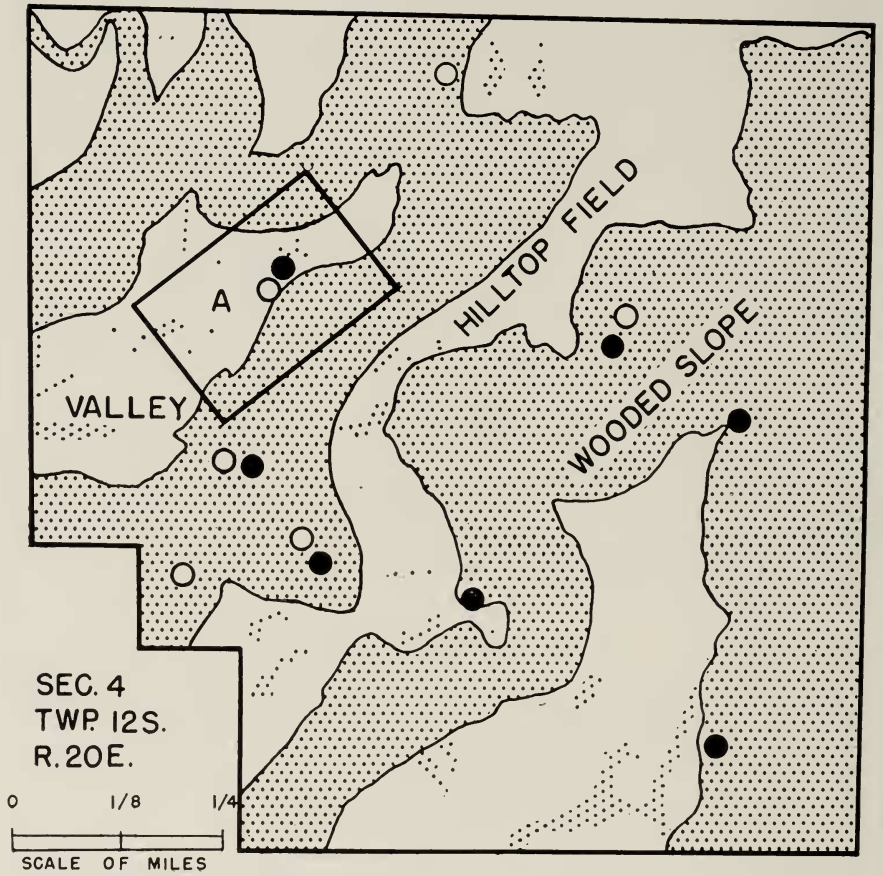

Fig. 1. Map of University of Kansas Natural History Reservation showing locations where pairs or singing males of summer tanagers were recorded in 1952 (solid circles), and in 1953 (open circles).

Pre-nesting Behavior

Tanagers tended to stay in tree canopies, where they were inconspicuous and were usually unnoticed except when the distinctive clicking notes or song called attention to them. They were less wary than most other passerines in this locality, however, and often permitted approach to within 30 to 40 feet.

They sometimes exhibited curiosity, and flew nearer, with tail and crown feathers elevated, uttering clicking notes.

In early May, members of pairs were seen together on many occasions. The clicking notes seem to serve to keep each member of a pair informed of the other's whereabouts. In 1952 and 1953 a pair made its headquarters near the residence building at the Reservation, facilitating observations. History of this pair evidently was similar for the two years, but our records are

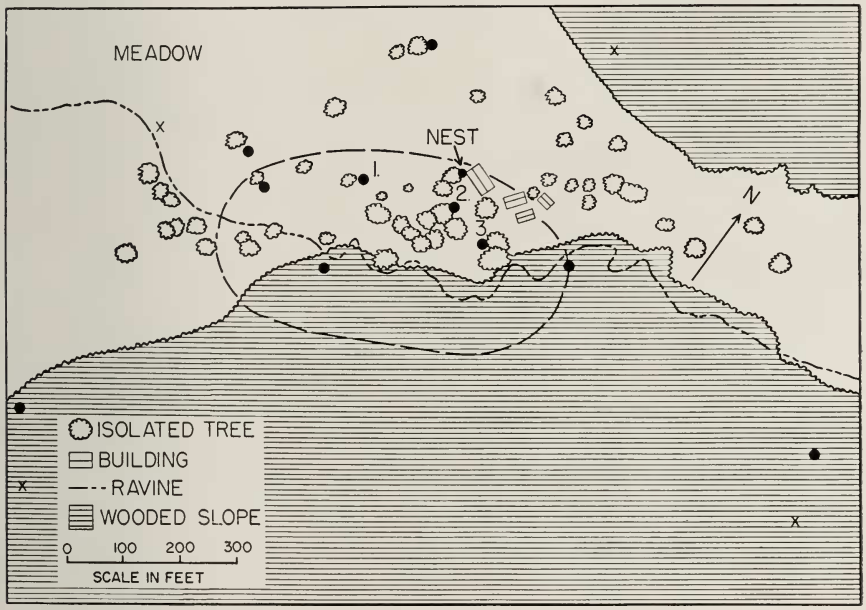

Fig. 2. Map of area shown in Fig. 1A, the area occupied by a nesting pair of summer tanagers in 1953. Dots show male's singing stations, with those most often used numbered in order of preference. Broken line encloses area within which the pair usually stayed. Outlying points occasionally visited by one or both members of the pair are shown by crosses, or by dots if singing male was recorded.

far more complete for 1953 (see Fig. 2). In that year singing was heard in the last three days of April and frequently in early May.

Throughout the season, frequent sudden and spirited pursuits of the female by the male were observed. The female, closely followed by the male, would fly rapidly and erratically, usually for a distance of several hundred feet. Often she was chased beyond the limits of t. e area to which that pair's activities usually were confined. Usually the course led into thick trees where the outcome could not be seen. Pursuits usually ended suddenly, the

birds resuming their routine activities. On some occasions the male followed the female slowly from tree to tree, both uttering clicking calls.

Nest Building

On the morning of May 11, the female was twice observed at a certain spot screened by thick foliage in the fork of an elm branch near one corner of the house. She was seen coming there again several times in the following week. On the afternoon of May 18, she was observed again, this time carrying stems to the nest site at this same place, in a horizontal crotch approximately 8½ feet above the ground. She was seen to fly to the ground nearby and find stems. On the morning of May 19, hasty inspection disclosed that as yet only a few stems had been deposited in the crotch. In the next few days additional material gradually was incorporated into the nest. On May 20, between 7:00 and 7:30 a.m., both members of the pairs made several trips to the nest. Only the female carried material. The male's function seemed to be to stand guard as she worked. Once when the female returned to the nest, a pair of Black-capped Chickadees (*Parus atricapillus*) were within a few feet of it and she drove them away by flying at them several times before depositing her load. Ordinarily she spent several minutes at the nest incorporating each load of material. From May 21 to 24, activity in building was greater than it had been previously, and the nest grew at a relatively rapid rate. Sometimes a round trip was made in as little as five minutes. The female ordinarily spent several minutes on the nest or beside it after her arrival with a load. At this stage she usually searched for nesting material along a ravine at the edge of the woods approximately 200 feet from the nest.

Incubation

On May 29 one egg was found in the nest, and on May 30 a second had been laid. On the morning of June 1, the clutch of four eggs was complete and the female had begun incubating. She permitted an observer to climb within four feet before she left. On June 5, at 9:00 a.m., the eggs were found to be uncovered. A few minutes later the female was heard nearby giving clicking notes and food calls, whereupon the male appeared and chased her several hundred feet south across the ravine and back again to the nest.

The eggs were observed daily during their incubation. On June 11 at 2:00 p.m. the female was sitting on the rim of the nest watching intently, while the male was perched a few feet away. Late in the afternoon we checked the eggs and found them all unhatched. On the following morning the male delivered food to the female as she sat on the nest. At 8:15 we checked the eggs and found that two had hatched. The third probably hatched later this same day, as it was found to have hatched on the following morning when

the nest was next examined. Thus the incubation period was approximately eleven days. The fourth egg did not hatch, and it still remained in the nest when the young were fledged.

The Nest

The nest was removed for study after the young were fledged. It was wedged in a 40° horizontal fork of the limb. Each branch was just under an inch in diameter. When removed from its support, the nest had a hole on one side which had been filled by the branch. The nest was 110 mm. outside and 75 mm. inside in greatest diameters, with minimum diameters of 83 mm. outside and 62 mm. inside. Depth was 35 mm. to the bottom of the bowl and 55 mm. to the bottom of the nest. The nest consisted of dried herbaceous vegetation of the previous year's crop and there were three main layers. The basal layer consisted chiefly of the panicles of white vervain (*Verbena urticifolia*). There were at least 41 of these, mostly 1 mm. to 1.5 mm. in greatest diameter and three to five inches long, each with several branches and with numerous minute protuberances where the inflorescences were based. These roughened and branched stems tended to adhere to each other and to the elm limb. Those deposited for the nest foundation were wedged into place adhering to the rough bark of the elm limb and providing a base for the support of additional material. A second layer, not entirely distinct from the basal layer and firmly woven into it, consisted of longer, more flexible stems of grasses, nearly all Japanese chess (*Bromus japonicus*), some with roots or empty seed heads, or both, still attached. These stems were mostly a little less than 1 mm. in diameter and up to two feet long, and 46 of them were counted. Material of the two outer layers was so tightly bound together that separate pieces were removed with difficulty and, as some breakage was unavoidable in the process of dismemberment, the exact number of units could not be determined. Binding material consisted chiefly of the shredded fibers of the stems themselves. Spider web had been included also, the tough, sticky strands of a large araneid, probably *Neoscona* sp. The web may have been gathered separately or may have been already attached to the stems. The inner layer lining the nest bowl was a mat of fine grass stems, mainly or entirely muhly grass (*Muhlenbergia Schreberi*) 0.5 mm. or less in diameter, and three to eight inches long. A total of 215 of these stems was counted. They were laid down in all directions and were woven and bound together much less tightly than the material of the outer layers. Material of the outer layer weighed 1.7 gm., that of the middle layer 1.8 gm., and that of the inner layer 2.7 gm.

Care of the Nestlings

Both parents participated in feeding the young. A partial record of their activities on June 15 is recorded below.

9:29 a.m.	Male delivered food to young.
9:30	Female delivered food and brooded briefly.
9:47	Male delivered food.
10:08	Female delivered food and brooded until 10:27.
10:30	Male delivered food and stayed at the nest for approximately one minute.
10:55	Both parents approached the nest and the male perched on a telephone wire fifty feet from it while the female delivered food and brooded.
4:06 p.m.	Female delivered food and sat on edge of the nest until 4:20.
4:57	Male delivered food and stayed at nest until 4:59.

5:05 Male delivered food and left.
5:15 Female delivered food and left.
5:20 Male returned briefly to feed young.
5:27 Female delivered food.
5:47 Female came to nest and brooded until 5:54.

On June 16, a Red-bellied Woodpecker (*Centurus carolinus*) was seen several times in the tree near the nest, and was driven away at least once by the male tanager.

Development of the Nestlings

At hatching the young were pink-skinned and well covered with buffy gray down. The edges of their bills were bright yellow. Their development was phenomenally rapid. Although attempts to measure these living young were not wholly satisfactory, the trend of growth is shown by the figures in Table 1. All measurements are to the nearest millimeter. For most of the samples,

Table 1

Growth in Young Summer Tanagers from Hatching to Fledging

Date	Number measured	Total length, mm.	Body length	Tarsus	Hind toe	Culmen	Gape	Weight, grams
June 12	1	—	24	8	5	7	9	4.2
June 13	1	42	—	8	6	7	13	5.2
June 14	2	52	30	11	7	6	14	8.7
June 15	2	56	34	13	9	8	13	11.4
June 16	—	—	—	—	—	—	—	—
June 17	2	74	44	19	11	10	14	17.3
June 18	2	79	45	19	11	10	14	17.1
June 19	3	87	46	19	12	11	13	17.3
June 20	2	93	48	19	13	11	14	17.8
June 21	—	—	—	—	—	—	—	—
June 22	1	96	50	18	13	11	14	18.2

only one or two of the three young were measured, as it was deemed inadvisable to remove all from the nest simultaneously. The young were not recognized individually for several days after hatching, and the records on consecutive days may have been based on different nestlings which differed somewhat in their development. Deviations from the general trend of growth are due in part to this factor.

On June 15, the three-day old nestlings had their eyes open but were sluggish and indifferent. Quills of the remiges had grown to 11.5 mm. Two days later these remiges had grown to 25 mm., and the feathers were beginning to

emerge from their sheaths in the most advanced nestling. The young clung tenaciously to the nest lining and were removed with difficulty on this date. On June 18, at an age of six days, one nestling squeaked in protest when removed from the nest. When placed on the top of a laboratory desk, it hopped about, chirping, its activity contrasting with the quiescence of all the nestlings on earlier dates. The slightly smaller nest mate was still quiescent, however. When both were returned to the nest, the active one raised itself onto the nest rim.

At 5:00 a.m. the following morning we were aroused by high-pitched, penetrating squeaks in the neighborhood of the nest and ran outside, thinking a predator was raiding it. The disturbance had ceased abruptly, but a Red-bellied Woodpecker was nearby in the tree. A few minutes later, looking through the window, we saw one of the nestlings hoist itself onto the nest rim. After a pause, it edged along unsteadily, out on the adjacent limb for several inches. It was maintaining a precarious balance with feeble fluttering, in what appeared to be an absurdly premature excursion. It made its way back along the branch but it continued without a pause past the nest. When it had progressed some inches farther, the nestling suddenly lost its balance and, fluttering frantically, gradually swung around to the lower side of the limb. There it hung upside down for a few seconds before it dropped to the ground, having the good fortune to fall in high brome grass where it was uninjured. Another nestling was found to have left the nest earlier the same morning, and it was located concealed in the grass a few feet away. The adults were making frequent trips with food which was delivered mainly to the single nestling remaining in the nest. However, within half an hour, this third nestling went through the same procedure already described, edging out onto a limb, then losing its balance and dropping into the grass.

To facilitate further observations, all three young were then gathered and placed in an open cardboard carton on the ground under the nest. The adults brought food regularly. The female was seen to make four trips between noon and 1:00 p.m. Once she left carrying a fecal pellet, but many other feces accumulated in the box, where the young were kept throughout the day.

Though still feeble and undeveloped for life in the open, the young had changed strikingly since the preceding day. The ends of the primary feather vanes were exposed to a length of 15 to 20 mm., and bodies were beginning to acquire a feather covering, especially on the breasts. The tail feathers had scarcely grown out at all.

On June 20, after being kept indoors overnight, the young were placed in the box beneath the nest soon after daybreak. At 6:00 a.m. shrill chirping similar to that heard on the preceding morning attracted our attention and,

hastening to the window, we saw a Fox Squirrel (*Sciurus niger*) approaching the box. Both parents were fluttering beside it and scolding. The squirrel, alarmed at our presence, fled to the shelter of the tree trunk and did not return. Through the day the female continued to feed the young confined in the carton, and several times she was seen to carry away fecal pellets. Late in the afternoon two young were missing from the carton. They were located by their chirping in the grass about five feet apart and both were returned. However, within a few minutes, one was seen to hop out a second time. It hopped and fluttered through the grass for about fifteen feet to the base of a large elm tree. Clinging to the rough bark, and vigorously fluttering its stubby wings, it walked up the vertical trunk for nearly four feet, then dropped back to the ground. It made several more similarly futile attempts to climb into the tree, while the female fluttered beside it, calling as if in encouragement. All the fledglings had made conspicuous gains in strength and vigor since the preceding day. By dusk only the most retarded one remained in the box, and again it was kept indoors overnight. At 4:45 a.m. it was put out beneath the nest. The female came and fed it at 5:00 a.m. At 5:30 she came again with food and, perching on the edge of the carton, she called to the young bird, causing it to flutter up beside her, thus escaping from its confinement. Several times during the day we retrieved it for further observation and confined it in other cages with higher sides open on top. Each time it escaped. Throughout the day young could be heard calling in the grass, chiefly within a 30-foot radius of the nest. They had become more wary and ceased to call whenever a person approached.

Behavior of Fledglings

On June 22 at 8:00 a.m. the female was seen to come to the trunk of the nest tree and feed one of the young which was perched on a twig five feet above the ground. When an observer approached, this fledgling "froze" in a bittern-like stance with bill pointing upward. When the observer came within reach, the fledgling flushed and flew 60 feet to a twig of another tree, maintaining its level. In attempting to alight, it lost balance and flew off in a new direction for 30 feet, then dropped into the grass. There it was found again frozen in the bittern-like stance observed previously. It did not flush from this low, concealed perch and it allowed itself to be grasped. Then it struggled and called with a high *sgwee ee rr* repeated several times. The sound caused the female to fly down scolding. For the several minutes that it was confined in a cage, the fledgling fluttered in vigorous attempts to escape and frequently uttered the two-syllabled hunger call *zhürri*, louder than it had called previously while in the open. Some of the exposed vanes of the primary feathers were as much as 28 mm. in length, and the rectrices had

grown to lengths up to 6 mm. The fledgling was now well feathered. The dorsal feathers were dark gray with yellowish edges, and the breast feathers were pale gray with dark streaks. Down was evident only on the head. The bill was mainly olive, with yellow at the tip and at the corners of the mouth.

Within the next two days the young shifted away from the vicinity of the nest tree to thick woods beside and beyond a ravine 200 feet farther south. They were not seen again at close range, but the family group was glimpsed in the tree tops from time to time. On July 10 and 11, for instance, a fledgling was seen to follow the female, giving food calls, while the male was nearby. As the tanagers were staying in the tree tops and were difficult to follow, or even to see, we were unable to determine how many fledglings remained but seemingly there were at least two.

Activities in Late Summer

The young were not definitely recorded after July 11, and may have dispersed from the parental territory at about this time. The adults were seen and heard frequently in their territory throughout July. The male's song was one of the most prominent of bird voices in late July and early August. His song began in morning twilight, often while Whip-poor-wills (*Caprimulgus vociferus*), Barred Owls (*Strix varia*), and Horned Owls (*Bubo virginianus*) were still calling, and he resumed singing from time to time throughout the day. On August 10 singing was heard frequently. On subsequent days song was no longer to be heard, although the clicking calls of tanagers were heard on August 14, 25, and 28.

Similarly in 1952, singing ceased abruptly in our absence between July 27 and August 11, although brief snatches of song were heard on August 21 and September 7. At least some of the tanagers remain in this area throughout most of September. There are specimens in the University of Kansas Museum of Natural History collected on the 14th, 15th, and 25th of that month. On September 27, 1953, a male was seen in a walnut tree near the house, giving the clicking call notes. Twice in the quarter hour that it was watched, it was seen to catch large black wasps (*Polistes fuscatus*) abundant in the vicinity. These were eaten after much pecking and battering.

Summary

There are many records of the Summer Tanager for Douglas County, Kansas, and scattered records for other parts of extreme eastern Kansas. Several pairs breed in the vicinity of the University of Kansas Natural History Reservation every year. Tanagers arrive approximately the last week of April.

In one pair observed in 1953, nest-building extended over a little more than

two weeks and was done entirely by the female. Incubation lasted eleven days. From a clutch of four eggs, three hatched and all the nestlings were fledged. At an age of one week all three young left the nest, one at a time, and fell to the ground. At this age, although nearing adult size, the young were still remarkably undeveloped, feeble, and nearly helpless, depending almost entirely on concealment in ground vegetation. After spending three days hiding in the grass near the nest site, the young became sufficiently strong and well feathered to fly into nearby trees. Soon they moved away from the nest site but remained in the parents' territory for nearly three weeks longer. Tanagers remain in the general area through August and September. Singing ceased abruptly after August 10. For the remainder of the season tanagers were usually silent and inconspicuous.

Natural History Reservation, University of Kansas, Lawrence, Kansas, February 1, 1954